THE ROLE OF ATACMS IN JFACC PLANNED DEEP OPERATIONS

A Monograph
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ABSTRACT

THE ROLE OF ATACMS IN JFACC PLANNED DEEP OPERATIONS by MAJ Leonard S. Moskal, USAF, 49 pages.

This monograph discusses the role of The Army Tactical Missile System (ATACMS) in JFACC planned deep operations. Since Operation Desert Storm, all of the services have been involved in a debate over their respective roles and missions. Part of this debate has been who should control ATACMS and how should it be used in the deep fight. This monograph assumes that the JFACC will be responsible to the JFC for controlling the deep fight and will need to employ ATACMS to conduct effective operations.

This monograph begins by attempting to establish a definition of deep operations that is acceptable to both the Army and the Air Force in order to establish some form of deep fight boundaries. Once the definition is established, the monograph analyzes the command and control procedures that were employed by the JFACC, under direction of the JFC, in Operation Desert Storm.

Next, the monograph compares the capabilities of ATACMS with other weapons systems that are available to the JFACC. Using this frame of reference, it discusses when the JFACC may need to employ ATACMS instead of other weapon systems. Command and control procedures are also examined to determine if they are sufficient for ATACMS or if they need to be modified.

Finally, the monograph considers various considerations in Army and Air Force deep operations that may enhance the effective employment of ATACMS and deep operations in general.

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I. INTRODUCTION

Operations Desert Shield and Desert Storm have become examples of how joint and combined operations should be performed. FM 100-5 states that the, "Desert Storm phase of the 1990-1991 Persian Gulf War reflects the dynamic joint and combined nature of the operational offensive and simultaneous operations in depth."[1] However, after the successful completion of operations in Kuwait, roles and missions arguments threatened to undermine many of the advancements made in inter-service cooperation.

The roles and missions debates that occurred after Desert Storm are not new. They have been occurring since the end of World War I. These inter-service debates began when, "The Services began to adapt the increasing combat potential of the airplane to its respective warfighting role."[2] Part of the current roles and mission debate has focused on the deep fight. This paper will specifically address the role of ATACMS in joint deep operations.

Field commanders were impressed with the operational capabilities and the responsiveness of the ATACMS. Only one complaint was made.[3] The units that employed the missile stated that a long range version of the system would improve the weapon's capabilities and would allow field commanders greater influence in the deep fight. The Army decided to develop a long range anti-armor weapon system. Their choice

was a longer range ATACMS.[4] This extended range ATACMS was initially designated IATACMS and now ATACMS Block 1A.[5]

ATACMS Block 1A, which could be used to influence the deep battle, was immediately seen by the Air Force as an encroachment on its mission. In Operation Desert Storm, the JFACC had the responsibility for controlling all theater air assets conducting deep operations.[6] These operations included long range missiles such as conventional the Air Force's conventional air launched cruise missile (CALCM) and the Navy's tactical land attack missile (TLAM). Advocates of airpower believe that the Army should be responsible for the close battle under the purview of the Land Component Commander, normally an Army or Marine Corps officer.[7] This close battle includes the "close airspace"[8] as well as the close air support missions. It is defined, "by the fact that our people are fighting on the ground there."[9] This perception that only the close fight is the responsibility of the Army or Marine Corps is because "Infantry, armor and artillery operations are all roles in ground combat."[10] These forces make up the majority of Army and Marine Corps assets. The Air Force has most of its assets involved in the deep fight and therefore should have the primary responsibility for that mission.[11] Following this logic, the Air Force believes control of the deep and high battle should be the responsibility of the air component commander who is normally an Air Force or Navy aviator. The Army should focus on modernizing those forces required to fight

the close battle and leave deep operations and equipment, such as ATACMS, to the Air Force.[12]

The Army does not see the separation of the close and deep battles along service lines as clearly as the Air Force. They see deep operations as essential to successful mission execution. The Army conducts deep operations using, "Systems organic to Army echelons and those of other services or allied forces."[13] Limiting the Army to close operations is in violation of its basic doctrine. The Army also feels that any attempt by the Air Force, "To bar the other services from deep operations is an attempt to divide the battlefield into fixed boxes."[14] This is seen as an over simplified view of future battlefield operations that will be extremely fluid. The Army needs ATACMS as its, "principle weapon system"[15] for conducting deep operations on these fluid battlefields. ATACMS is also essential for the Army to perform force protection.[16] Force protection is one of the Army's dynamics of combat power.[17]

The fight over ATACMS has not been made any clearer by the 1993 Report on the Roles, Missions and Functions of the Armed Forces that was accomplished by the Chairman of the Joint Chiefs of Staff. The report states that while "America has only one Air Force...The other Services have aviation arms essential to their specific roles and functions but which also work jointly to project America's air power."[18] The report appears to support the Army's belief that the ATACMS is appropriate to its roles and

missions. The GAO's assessment of the 1993 Report is that: "It did not recommend significant reductions in overlapping functions."[19] The GAO further states that ATACMS must be considered along with other weapon systems when, "Examining the potential for reducing unnecessary duplication."[20] This appears to add fuel to the Air Force argument that roles, and therefore equipment, should be divided along service lines.

The Army is currently in the full rate production (FRP) phase of ATACMS Block 1 and the engineering and manufacturing development (EMD) phase of Block 1A. The Army plans to buy 1,647 total missiles.[21] The Air Force must accept the fact that ATACMS is an Army weapon system that will play a key role in future conflicts. This raises a major question. Will the Army allow the Air Force to use ATACMS as part of the JFACC controlled deep operation?

The Army feels giving control of ATACMS to the JFACC would reduce its' effectiveness.[22] However, the GAO Report states, "All assets with interdiction capabilities...should be considered when calculating requirements and assessing capabilities for theater air interdiction."[23] Where ATACMS fits for theater air interdiction has to be determined.

The reasons for the inter-service debate are important to both the Army and the Air Force. However, in a time of reduced assets and required inter-service cooperation, there may be no room for these types of "turf battles." Both services must shift their focus from the fight over who will

control ATACMS to the more important question. How will ATACMS affect the deep battle?

The research method used in this paper is as follows. The paper begins by attempting to establish a definition of deep operations IAW JFACC, air force, army and joint publications. Once these operations are defined, the paper looks at how the JFACC employed Navy TLAMs and Air Force CALCMs to see what employment options are applicable to ATACMs. The paper also compares systems destructive capabilities, accuracy and responsiveness. These destructive, accuracy and responsiveness capabilities will then be compared to manned vehicles. After developing a base line for destructiveness, responsiveness and accuracy, the paper discusses considerations for FSCL placement and how it should be influenced by all weapon systems capabilities not just missiles or aircraft. The final portion of the paper will review all the data compiled and determine whether or not the JFACC can, in compliance with the JFC's intent, employ ATACMS appropriately in the deep fight.

All source documents will be unclassified; therefore, missile range and warhead size will not be exact. However, there is sufficient unclassified information to allow an accurate comparison of all weapons systems. Destructive capabilities are not JMEM based, but are based on relative warhead size and submunition type.

This monograph has six major sections. Section one is the introduction. This section poses the research question and gives some background on the importance of the question. The paper outline is included in this section with the research methodology.

Section two defines deep operations and planning considerations based on JFACC, army and joint publications. The major portion of this section is devoted to compiling all the information contained in the various services and joint publications and then establishes a definition for deep operations that is acceptable to both services. This section also contains information on how deep operations were conducted in Operations Desert Storm and Desert Shield and what lessons can be learned from them these experiences. Section two also reviews how weapons systems capabilities have affected control measures, such as FSCL placement, in previous operations.

Section three contains a comparison of the operational capabilities of ATACMS with surface to surface and air to surface long range missiles such CALCMs and TLAMs. Section four compares ATACMS with aircraft carried direct attack munitions. Only fixed wing aircraft will be considered because the JFACC normally does not control Army attack aviation. The focus here is on warhead compatibility with target types. This includes warhead size, submunition type, weapon accuracy and effectiveness on planned target types. Warhead size is considered to determine the number of

weapons required to achieve the desired effect on a given target. Responsiveness, flight times, flight profiles and weapon system survivability are also addressed here.

Section five analyzes the operational capabilities of deep strike weapons systems and how control measures enhance or prevent the optimum use of deep strike assets, specifically ATACMS. Using the data from the previous two sections, the paper will establish a basis for comparison of ATACMS with other deep strike assets. In this section, the reader will be given considerations as to whether or not current control measures are adequate for controlling ATACMS. Specifically, do current control methods prevent the JFC, through the JFACC and army planners, from optimizing the capabilities of ATACMS as well as other deep strike assets? If not, what new control measures are required? This section will also emphasize the importance for the JFC, JFACC, army commanders and planners to consider all available assets and possibilities when planning employment of deep strike systems

Section six summarizes the analysis of the monograph and draws conclusions. It begins with a review of all the major points that were made to refocus the reader on the research question. How will ATACMS affect the deep battle? Recommendations, for the use of ATACMS, are included. The focus of this section is how to take all the data compiled and determine the optimum way the JFACC can employ ATACMS in the deep fight. This will include ways to coordinate ATACMS

operations with other deep operations and ways to use the weapon system to enhance other deep strike assets.

II. DEEP OPERATIONS

To examine how the JFACC can incorporate ATACMS into deep operations, one must adequately define deep operations. For the Air Force, deep operations are not easily defined using doctrinal manuals. Air Force Manual (AFM) 1-1 vol I discusses deep operations in relation to interdiction.

> Interdiction may have tactical, operational, or strategic-level effects. The depth at which interdiction is conducted often determines the speed with which its effects are seen. Depending on a variety of factors, such as the nature of enemy forces and communications infrastructure, interdiction deep in the enemy's rear will have a broad operational or strategic-level effect but a delayed effect on surface combat. Such operational and strategic-level effects normally will be of greatest concern from the theater perspective. In contrast, targets closer to the battle are likely to be of more immediate concern to surface maneuver units. Interdiction close to the battle area will produce more quickly discernible results, but only on forces in the vicinity of the attacks. Regardless of where interdiction is performed, air and surface commanders together should consider how surface forces can be employed to enhance the ability of air interdiction to support the campaign's objectives.[24]

AFM 1-1 vol II states that the Air Force conducts interdiction over a "broad, deep, area"[25] or "concentrated in a small area close to friendly surface forces."[26] The JFACC primer gives a clearer starting point for Air Force deep operations. Under the heading Interdiction and Deep Operations, the JFACC primer describes the airman's perspective of deep operations.

> The component commanders with forces at risk beyond the FSCL are the JFACC and the Special Operations Component

> Commander. The JFACC's C3I architecture is uniquely capable of planning and controlling operations in territory occupied by hostile forces. The JFACC is responsible for a number of missions, none of which is geographically bounded. Responsibility for synchronizing theater interdiction assets should be vested in the commander who has the preponderance of attack assets and the C3I capability to conduct these operations; for interdiction it is normally the JFACC.[27]

Combining these statements, the Air Force perspective on deep operations is that they begin at the FSCL and extend into the strategic infrastructure of the enemy.

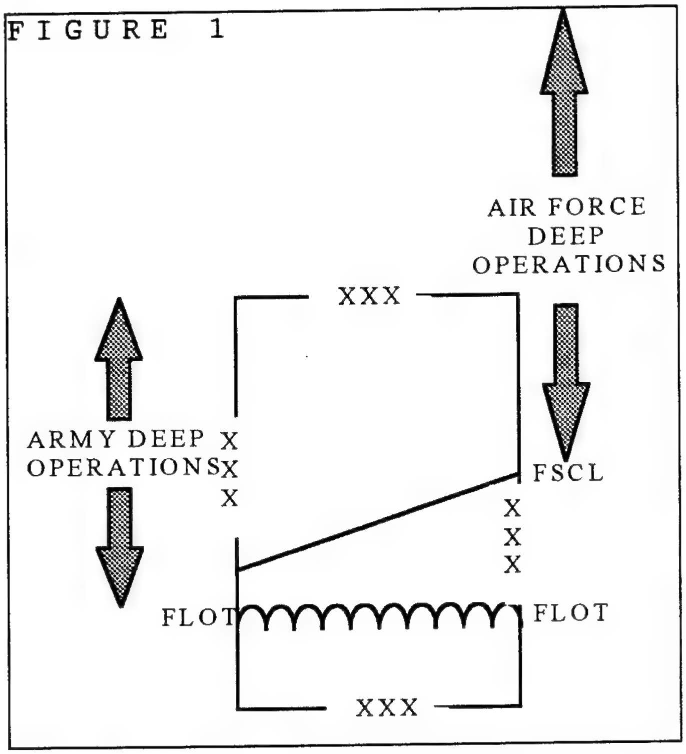
The Army's doctrinal manuals also fail to give a clear picture of deep operations. Field Manual (FM) 101-5-1 defines deep battle as "All actions which support the friendly scheme of maneuver and which deny to the enemy commander the ability to employ his forces not yet engaged at the time, place, or in the strength of his choice."[28] This definition is in agreement with the Air Force definition, but is still very vague. The FM 100-5 definition states that army deep operations can be conducted by "Airborne and air assault forces, attack aviation units, and high speed armor forces" [29] as well as artillery.

> Deep operations are those directed against enemy forces and functions beyond the close battle. They are executed at all levels with fires, maneuver, and leadership. Deep operations affect the enemy through either attack or threat of attack. They expand the battlefield in space and time to the full extent of friendly capabilities. Effective deep operations facilitate overall mission success and enhance protection of the force. The deep battle is designed to nullify the enemy's firepower, disrupt his C2, destroy his supplies, and break his morale. A well-orchestrated deep battle may help cause the enemy to be defeated outright or may prevent him from achieving his intended objectives. In conducting simultaneous attacks in

> depth, Army forces employ long-range, intelligence-acquisition and targeting assets, including electronic warfare and joint assets, to track enemy forces, to complicate their operations, and to determine the effects of our strikes in depth.[30]

From the proceeding definition, deep army operations are conducted beyond the close battle. From 100-5, "Forces in immediate contact with the enemy, in the offense or defense, are fighting close operations. Close operations are usually the corps and division current battles. At the tactical level, they include the engagements fought by brigades and battalions."[31] Therefore, the Army area for deep operations extends from the close fight to the maximum range of air assault forces, attack aviation units, high speed armor forces or artillery. Comparing this definition to the Air Force definition of deep operations there appears to be some overlap. See figure 1.

The major area of overlap occurs between the FSCL and the maximum range of army assets. As will be shown in chapter V, this overlap is the principle source of much of the interservice friction over ATACMS use in deep operations.



In Operation Desert Storm central command (CENTCOM), the theater headquarters, established the FSCL. It was used as a boundary to establish control of airspace. The ground commander was responsible for the area between the FLOT and the FSCL and the JFACC was responsible for the area beyond.[32] During the air campaign, the FSCL was placed close to the FLOT and the JFACC controlled operations beyond it. The primary concern of the JFACC was fratricide due to the large numbers of coalition aircraft operating in the Kuwaiti Theater of Operations (KTO).

III. Comparison of Operational Capabilities of Unmanned Weapon Systems

To understand how ATACMS best fits into deep operations, planners must be able to compare its capabilities to other deep strike assets. This section compares ATACMS to two

other unmanned deep strike assets: the Air Force CALCM and the Navy TLAM called Tomahawk. By establishing the similarities and differences in capabilities, commanders will be able to determine the best way to use ATACMS in the deep fight.

ATACMS is designed to provide the Army an autonomous, long range, all weather, day/night, missile system that is designed to defeat high priority targets throughout the depth of the battlefield. The system will be a corps asset but can also be used to support JTF operations in immature theaters.[33]

ATACMS was developed as a corps support weapons system that would be a replacement for the Army Lance. It was identified as a remedy to the limited number of aircraft that the corps would have available for conducting BAI missions. The Army also became aware of the expanding battlespace that would occur in future conflicts. ATACMS allows corps commanders to influence the deep fight on the expanding battlefield while operating at an increased tempo. ATACMS also gives the Army the capability to bring deep firepower when accomplishing force projection missions.[34]

Four versions of the ATACMS are planned to be fielded. ATACMS Block I, IA, II, and IIA. Currently Block I is operational with a planned number of 1545 to be deployed. Block IA has a planned first unit equipped (FUE) date of 1998 with 754 deployed. Block II and IIA have FUE dates of 2001 and 2003 respectively with planned deployment numbers

of 1122 and 550. All of the systems have the same motor, the changes in weapon system are based on range and improvements made to the internal guidance system. The longer range ATACMS have a reduced warhead. ATACMS is fired from the existing M270 MLRS launcher with 2 missiles per launcher. This gives it the same mobility as the current MLRS systems.[35]

ATACMS Block I has a minimum range of 25 km and a maximum range of 165 km. That equates to a range of 13 to 90 nautical miles. The warhead on the ATACMS Block I is approximately one thousand pounds. It consists of 950 anti-personnel, anti-material (APAM) bomblets. The missile operator has the option of three dispense patterns for the APAM submunition. ATACMS Block I is a semi-ballistic, inertially guided missile. The Block I missile has an off-axis launch capability that reduces the counter fire threat.[36] When using the off-axis capability, the missile takes a more circuitous route to the target. This prevents counter battery radar from determining the exact location of the missile launch. There is a reduction in maximum range when this launch mode is used.

Block I is designed to attack stationary soft targets such as command and control centers, air defense sites, reload and logistics sites. The system is compatible with current and planned sensor systems as well as existing and planned fire support command controls and communication (FSC3) systems.[37]

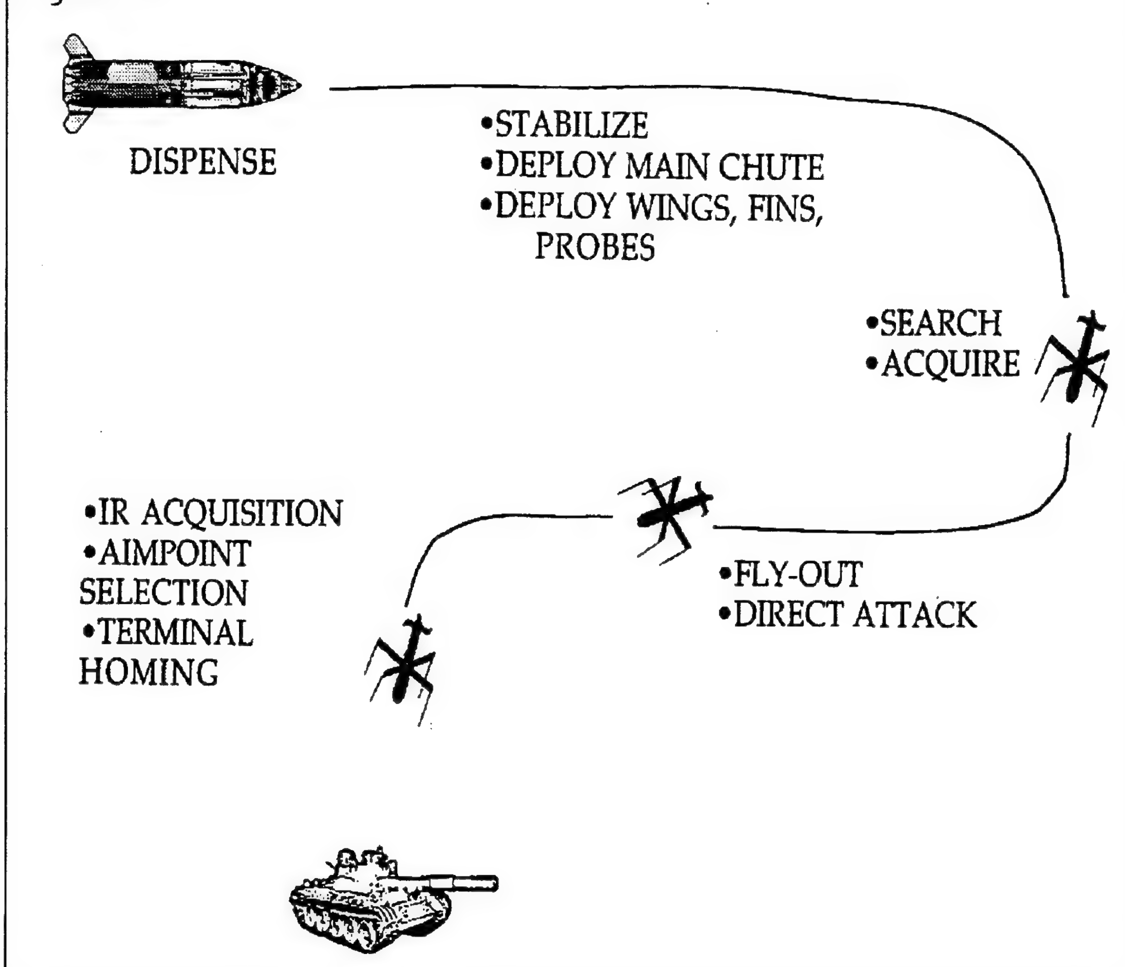
Block IA is an improved version of the Block I missile. It has the same off-axis capability and three dispense patterns. The Block IA has an improved range of 100 to 300 km (53 to 160 nm) and an improved guidance. Instead of the inertial system in Block I, the Block IA missile has a GPS-aided inertial system that gives it improved accuracy. The trade off is the reduction in APAM sub-munitions that give the Block IA system its greater range. However, with the increased accuracy, there should be little decrease in the lethality of the weapon system. Just like the Block I, Block IA is designed to attack stationary soft targets such as command and control centers, air defense sites, reload and logistics sites. The system is also compatible with current and planned sensor systems as well as existing and planned FSC3 systems.

The Block II ATACMS incorporates two major changes from the Block I version. The Block II missile has a GPS-aided inertial guidance system just like the Block IA version, but it has a different submunition. The Block II has a payload of 13 brilliant anti-armor (BAT) submunitions. The difference in submunition gives the Block II system a blunter nose cone. This reduces the range of the missile to 35 to 140 km (19 to 75 nm).

The BAT submunition is designed to attack moving armored vehicles. It has acoustic and IR sensors and a search area of 50 square kilometers (4 km radius). The onboard sensors permit the BAT submunition to conduct autonomous search

operations within its search area. It then seeks out and destroys moving combat vehicles.[38] (Figure 2) The targets must be moving in order for the acoustic sensors to detect them. The BAT warhead is a tandem shaped charge that is effective against tanks, APCs, self propelled air defense artillery and field artillery.[39] The Army plans to buy 20,220 BAT submunitions.[40] Block II is compatible with current and planned sensor systems as well as existing and planned FSC3 systems.

Figure 2



The Block IIA ATACMS improves on the Block II system by having increased range as well as an increased capability submunition. The range of the Block IIA missile is 100 to 280 km (53 to 150 nm). The missile warhead contains preplanned product improvement (P3I) BAT submunitions. The P3I BAT submunition has acoustic, IR and millimeter wave (MMW) sensors. The MMW sensor on the P3I BAT allows the submunition to be targeted against non-moving vehicles. The P3I BAT has a search area of 50 square kilometers (4 km radius). The P3I BAT warhead is a tandem shaped charge that is effective against tanks, APCs, self propelled air defense artillery and field artillery. The MMW seeker head also makes short range ballistic missile systems (SRBMs) and heavy multiple rocket launchers excellent target choices. The improved sensors on the P3I BAT also makes the submunition more resistant to countermeasures.[41]

The CALCM is a long range, sub-sonic, air breathing, aircraft launched, conventional cruise missile. It is a modified version of the AGM-86 air launched cruise missile. The nuclear payload has been replaced with a conventional warhead. The guidance is a GPS-aided inertial navigation system (INS) that is extremely accurate. The missile flies a low level profile, after launch, to penetrate air defense systems. The warhead is a 1000 pound blast fragmentation high explosive which is effective against stationary soft to semi-hardened targets such as command and control centers, air defense sites, reload and logistics sites, electrical

grids, radio towers and buildings. The maximum range of the missile is 2900 km (1550 nm).[42]

The Tomahawk is a long range, sub-sonic, air breathing, ship launched, conventional cruise missile. The land attack missiles are the BGM-109C and BGM-109D. The guidance is a GPS-aided INS that supplements a digital scene matching area correlator (DSMAC). The DSMAC system uses digitized pictures of the terrain as update points. An onboard optical sensor compares the missile overflight position to the digitized terrain to make navigational updates in flight. This guidance system ensures an extremely accurate delivery of the munitions. The BGM-109C has a 1000 pound semi-armor-piercing warhead. It is designed to attack hardened shore targets such as naval bases or airfields. The missile has three separate attack profiles. It can dive into or fly into the target. It can also detonate its warhead over the target. The BGM-109D has a warhead that contains 166 BLU-97B submunitions. The BLU-97B is a combined effects munition that has the capabilities of armor-piercing, fragmentation and incendiary. The submunitions can be dispensed against three separate target groups. The missile uses a level delivery profile and can be programmed to continue flight to act as a decoy or to dive into a fourth target. Both missiles use a low level flight profile to avoid detection by surface to air threats. The range of the Block II Tomahawk, both BGM-109c and BGM-109D, is 277 km (150 nm). The range of the Block III

Tomahawk, both BGM-109C and BGM-109D, is 1600 km (870 nm). All versions of the Tomahawk can be launched from either surface vessels or submarines.[43]

An overall comparison of warheads shows that ATACMS Blocks I and IA are effective against extremely soft non-moving targets and marginally effective against lightly armored vehicles.[44] The warheads on the CALCM and the BGM-109C Tomahawk version are as effective as the Blocks I and IA warheads against soft targets and also have capabilities to inflict damage on semi-hardened to hardened facilities. They are also limited to non-moving targets. The BGM-109D Tomahawk has capabilities against stationary armored vehicles. ATACMS Block II and IIA will have the capability to destroy moving armored vehicles, but not until the year 2001.

In considering responsiveness, assume that ATACMS and naval vessels would be in the theater of operations. If one does not make that assumption, only the air delivered CALCM could truly be considered globally responsive within a reasonable period of time. The ATACMS is usually the most responsive system once it is deployed into the theater.[45] The ATACMS missile is super-sonic and therefore much faster than a CALCM or Tomahawk and does not require the mission planning associated with either of the cruise missile systems. When using ATACMS in reactive operations, the minimum requirement to prosecute a target is grid coordinates.[46]

Survivability is broken down into two categories. the survivability of the missile and the survivability of the launch system. ATACMS is the more survivable of the missiles. The high speed and steep angled launch profile makes the ATACMS extremely difficult to engage without the most sophisticated of air defense systems such as Patriot. The slower air breathing cruise missiles, even though they have a low radar cross section, are more vulnerable to air defense systems as well as ground fire. When considering the survivability of the launch platforms, the cruise missiles' platforms are more survivable than ATACMS. Even though ATACMS has the off-axis launch capability, the fact that the cruise missiles launch vehicle can stand off in excess of 800 nm give them a more survivable position.

The following conclusions come from the comparison of ATACMS to CALCM and Tomahawk. ATACMS is the most responsive system if it is already in theater. Additionally, the ATACMS missile is more survivable than the cruise missiles. The cruise missile launch platforms, which may be 800 nm from the target, are more survivable than the ATACMS launch system. The cruise missiles have better range and can effect a larger target selection, but this will change once the Block II and IIA versions of ATACMS are fielded. ATACMS can not, now or in the future, be used to attack hardened targets.

IV. Comparison of Operational Capabilities of Manned Weapon Systems

Having established a comparison between ATACMS and unmanned weapon systems that were used in Desert Storm we will compare the capabilities of ATACMS to manned aircraft. This section specifically addresses the types of munitions that can be carried by manned aircraft. We will not look at specific aircraft performance capabilities, but treat the airframes as delivery vehicles and compare them as such when looking at survivability aspects.

To begin this discussion, one must understand that no airframe is limited to a specific mission type. "Missions define specific tasks, not capabilities or organizations. The roles and missions are, in turn, defined by objectives, not by the platform or weapon used. Most aerospace forces can perform multiple roles and missions." [47] In other words, any airframe can perform any mission. Limiting an A-10 to only CAS missions limits the number of airframes available to perform other missions. For this reason, any Navy or Air Force aircraft, that is capable, is considered available to deliver the weapons discussed in this section.

The first types of weapons considered are general purpose bombs. These are unguided gravity bombs, sometimes referred to as "dumb bombs." These weapons are either the 500 to 2000 pound class blast-fragmentation weapons or CBUs (cluster bomb units) and can be delivered by all fixed winged aircraft.

Blast-fragmentation weapons are extremely effective against soft to semi-hardened targets. Even though these weapons are unguided they are fairly accurate. Current aircraft capabilities allow these munitions to be delivered, from medium to high altitude, with a CEP of 200 feet.[48] (CEP is Circular Error Probable. This is the radius of a circle, drawn with the target as the center, that 50% of the bombs dropped will fall into.) As the delivery altitude decreases, the weapon accuracy increases. These weapons can be used against point targets or area targets such as large troop formations, buildings, POL facilities, ammunition stockpiles and many other target types. The greatest number of bombs dropped in Operation Desert Storm were unguided general purpose bombs. Most of these were dropped by B-52s.[49]

Combining general purpose bombs with guidance packages achieves precision munitions such as laser guided bombs (LGB) and GPS guided munitions. These weapons range from the 500 to the 4000 pound class. The MK-82 500 pound bomb is made into the GBU-12 LGB when the appropriate guidance package is attacked. This system was highly effective as a tank killer in Operation Desert Storm.[50] The MK-84 2000 pound can be made into the GBU-15 electo-optical guided bomb[51] or the GBU-24 LGB.

The GBU-15 is an air-launched glide bomb that has pinpoint accuracy. The GBU-15 can have either a TV or imaging infrared (IIR) seeker head. The AGM-130 is a rocket powered

version of the GBU-15 that has an increased stand-off range. Both of these systems are launch and leave munitions and can be combined with the BLU-109 2000 pound bomb to improve their penetrating capability.[52]

To improve the penetrating capability of the GBU-24, the BLU-109 can be used instead of the MK-84. The Air Force also has the GBU-27 that is similar to the GBU-24 and carried by the F-117. The GBU-28 is a 4700 pound penetrator that was developed as a bunker buster for use against deeply buried, hardened bunkers and command facilities. It can penetrate more than 100 feet of dirt or 20 feet of concrete. The GBU-24, GBU-27 and GBU-28 are LGBs and all three were extremely effective during Operation Desert Storm.[53]

The joint direct attack munition (JDAM) is a GPS-aided INS guided PGM. This system gives aircraft an all weather PGM capability. The JDAM system is used with the MK-83 1000 pound bomb or the MK-84 and BLU-109 2000 pound bombs. The JDAM product improvement program (PIP) will add a terminal seeker head. This will improve the all weather capability of the system and give the JDAM PIP the same accuracy as an LGB but without the weather limitations.[54]

There are several different types of CBUs. Cluster bombs are dispensers that are loaded with a large number of submunitions. These dispensers are released as a free-fall unit from aircraft just like a general purpose bomb. As the free-fall unit falls, the dispenser opens at a preset altitude or time after release. Once the dispenser opens

the submunitions inside are released and scattered. CBU submunitions are bombs or mines designed for use against light material, personnel, or armor.[55] Because CBUs are delivered by aircraft, these targets do not have to be stationary.

The CBU-52, 58, and 71 all have submunitions very similar to the ATACMS Block I and IA. The CBU-52 contains 220 of the BLU-61 submunition. Each one is a 2.7 pound bomblet. The CBU-58 and 71 contain 650 of the BLU-63 or BLU-86. These are .97 pound bomblets.[56] All of these submunitions are effective against the same types of soft targets as ATACMS Block I and IA such as command and control centers, air defense sites, reload and logistics sites.

The MK 20 ROCKEYE and the CBU-87 are anti-armor weapon systems. The MK-20 contains 247 MK 118 bomblets. Each bomblet weighs 1 pound and is capable of penetrating approximately 7.5 inches of armor.[57] The CBU-87 contains 202 BLU-97 combined effects munition (CEM) bomblets. Each BLU-97 weighs 3 pounds and has a scored steel case that is designed to fragment into approximately 300 pieces that are effective against lightly armored vehicles and personnel. The BLU-97 also has a shaped-charge liner designed to defeat armored vehicles.[58]

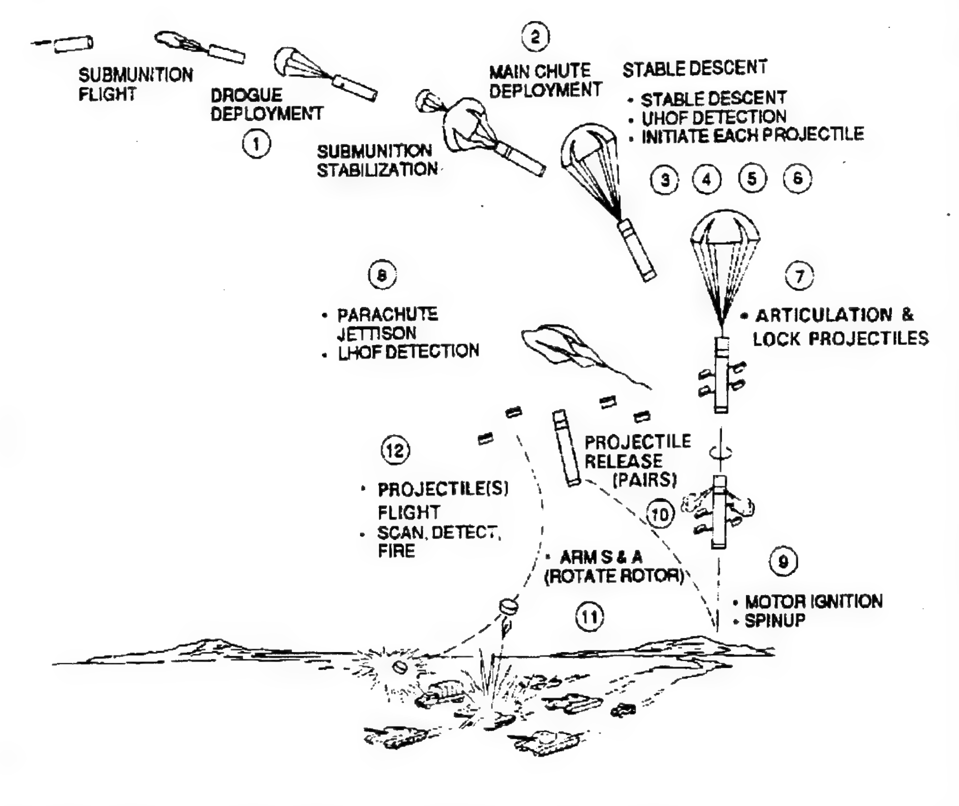
The CBU-89 is a mine delivery system. Each CBU-89 contains 72 BLU-91 antitank and 22 BLU-92 antipersonnel for a total of 94 mines. The BLU-91 is a magnetic sensing munition. It has a bi-directional, mass-focused, self-

forging warhead that is effective against tanks and APCs. The mine detonates when the magnetic sensor detects a target or when disturbed. The BLU-92 has a fragmentation warhead that is effective against personnel or light vehicles. It deploys 4 tripwires up to 40 feet from the mine. The mine is triggered by the tripwires or if disturbed. Both systems require approximately 2 minutes from dispenser opening to arm. They will self-destruct after one of three classified ground preset periods have expired or when the internal battery voltage drops below acceptable levels.[59]

The final CBU we will discuss is the CBU-97 sensor fuzed weapon (SFW). Each SFW contains 10 BLU-108 submunitions. The BLU-108 is made up of a nose electronics section, warhead launcher assembly, rocket motor, and an orientation/stabilization device. Each warhead launcher assembly has 4 projectiles that are similar to the BAT contained in the ATACMS Block II. The rocket motor is used to stabilize and induce a spin in the BLU-108. When the submunition is spinning, the projectiles are released in a randomly oriented "X" pattern. The projectiles are the kill mechanism of the SFW. Each one contains a two color IR sensor and a projectile warhead that is designed to kill armored vehicles. (Figure 3) Each projectile can scan an area 100 feet wide by 300 feet long. The combined scan pattern of all 40 projectiles is 700 feet wide by 1200 feet long.[60] The sensors in each projectile make the SFW a precision munition. The entire SFW system is an excellent

weapon against armored to lightly armored vehicle convoys or parked armor formations.

Figure 3



The final class of weapons that will be discussed are stand-off munitions; the AGM-65 Maverick and the joint stand-off weapon (JSOW). The AGM-65 Maverick is an EO guided missile that is effective against large land targets, ships and armor. It is a launch and leave system that has a stand-off range of 14 nautical miles. The seeker head can either be a TV or IIR system. The IIR system improves the Maverick's all weather capability. This system was highly effective in Operation Desert Storm.[61]

The(JSOW) is currently being developed jointly by the Air Force and the Navy. The JSOW is a highly lethal glide munition that gives the delivery aircraft a stand-off range of 17 nm with a low level delivery and 46 miles with a high-altitude launch.[62] The JSOW will have three variations. The first version will achieve initial operational capability (IOC) in FY98. This system will carry 145 BLU-97 CEM bomblets. The second JSOW variant will achieve IOC in FY00 and will carry six BLU-108 SFW submunitions. Both of these versions will have a GPS-aided INS guidance system. The final version, called JSOW P3I, will achieve IOC in FY04. This version will incorporate a data-link seeker for terminal guidance. It will carry a 500 to 800 pound unitary warhead. JSOW gives fixed wing aircraft the security of stand-off delivery along with the capability to attack several types of ground targets. The first two versions are capable of striking massed and moving light to heavily armored vehicles, aircraft, personnel, command and control antennae, weapon depots, artillery and refinery components. The final version has the capability to service point targets such as bridges, industrial components and energy production.[63]

An overall comparison of warheads shows that the large number of munition types available to fixed wing aircraft allow them to service a wider range of targets than ATACMS. This is true even for ATACMS Block II and IIA. The accuracy of ATACMS is not as good as precision guided munitions but

is comparable with all other weapon types delivered by aircraft.

In comparing responsiveness, again assume that ATACMS would be in theater. ATACMS appears to be the most responsive system, but this is not the case if an aircraft that is inflight can be used to service the target. In a low threat environment, fixed wing aircraft, just like ATACMS, only need target grids to prosecute a target.

Survivability goes to ATACMS. No aircrew is exposed to enemy air defense systems with an ATACMS launch. Even though JSOW reduces the exposure of aircrews to enemy systems, aircraft must still approach to within a minimum of 46 nautical miles of the target.

The following conclusions come from the comparison of ATACMS to fixed wing aircraft weapons. ATACMS is a more responsive system if it is already in theater when compared to aircraft on the ground. Aircraft in flight are more responsive than aircraft on the runway. Depending on their relative position to the target, they may be more responsive than ATACMS. The ATACMS system is more survivable than aircraft. Fixed wing aircraft have better accuracy and can effect a larger target selection.

V. Consideration of Operational Capabilities of Weapon Systems on Deep Operations Planning

The initial analysis of operational capabilities of deep strike assets is done by looking at the systems from a weaponeer's stand point. This paper has established that

ATACMS is the most responsive of all deep strike systems that may be available to the JFACC. However, that does not mean that ATACMS will usually be the weapon of choice. The warhead on the ATACMS severely limits the number and types of targets that can be effectively attacked by ATACMS. APAM is only suitable for extremely soft targets. There is also not a one for one trade off between ATACMS and aircraft sorties. For example, the F-16 can carry four CBUs of any type that was previously discussed.[64] This is equal to almost three ATACMS Block I and nine Block IA missiles. Comparing the submunition of the SFW with that of ATACMS Block II and IIA, apparently one F-16 sortie can kill as many tanks as twelve ATACMS Block II and twenty-six ATACMS Block IIA missiles. The capabilities of the F-16 are also current capabilities, not future enhancements. Bombers such as the B-1 and the B-52 can carry thirty CBUs.[65] This equates to approximately eighteen Block I, sixty-six Block 1A, ninety-two Block II and two hundred Block IIA missiles. The last number is especially significant since only five hundred ATACMS Block IIA will be fielded. All of these comparisons do not include the fixed wing aircraft's capabilities to drop precision munitions and destroy extremely hardened facilities.

Three planning considerations can be deduced from the comparison of ATACMS capabilities to other weapon systems that are available to the JFACC. First, ATACMS would not be the weapon of choice for the JFACC or his planning staff

when compared to all the other systems available. ATACMS would only be used when a highly survivable system was needed to kill an extremely soft target. A good example of this would be to use ATACMS to suppress enemy air defense systems when Air Force suppression assets were unavailable. Allowing the JFACC to use ATACMS as part of his deep operations would not relegate control of all ATACMS because the JFACC has many more capable systems at his disposal. The JFACC also could not argue that he must control all of ATACMS because he does have so many other assets available and could not justify reducing the assets available to corps commanders.

Second the ATACMS, just like the CALCM and Tomahawk, requires accurate coordinates and a non-moving target. An aircraft may be the more appropriate attack vehicle for targets that may have large location errors or pop-up unplanned target locations.[66] The speed and size of ATACMS gives the system the same low observable characteristics as the CALCM and Tomahawk. These similarities in characteristics, and the need to coordinate airspace when firing ATACMS,[67] suggest that the JFACC would plan to use ATACMS the same as CALCM and Tomahawk. This also does not mean that the JFACC would need to use all of the ATACMS. Using Desert Storm as an example, the JFACC had at his disposal CALCM and Tomahawk missiles. However, only 282 Tomahawk and 35 CALCM were used. The last Tomahawk was launched on 1 February 1991 and all the CALCMS were launched

on the first day of the air war. The air war was conducted from 17 January until 28 February 1991.[68]

The third planning consideration is how to conduct BAI and AI. It has been suggested that a BAI area that is controlled by corps commanders should be created. The premise is the Army can now conduct and control BAI with organic assets. JSTARS will allow corps commanders to see deep and ATACMS will allow the corps commanders to influence the deep battle.[69] Since corps commanders do not have the same command and control capabilities that are available to the JFACC, fixed wing capabilities could be limited due to increased control measures. The possible outcome of this is the creation of an area on the battlefield that is serviced by limited assets or only ATACMS. By creating an area that is serviced by limited assets, the area becomes a sanctuary for all target sets that cannot be effected or destroyed by the assets available to the corps commander. The same effect would occur if the FSCL would be pushed out to the maximum range of Army deep strike assets. Due to the command and control restrictions of aircraft operating inside the FSCL, a sanctuary would be created for numerous targets that were outside direct fire range of Army assets, but still inside the FSCL boundary. This underscores the importance for the JFC to consider the capability of all weapons systems in the theater when establishing control measures.

Using these planning considerations, current command and control methods will be analyzed to see if they allow the optimum employment of ATACMS as well as all other deep strike assets.

Chapter II addressed the overlap that occurs between Army and Air Force deep operations. The Air Force wants to control the deep fight beyond the FSCL and wants the FSCL placed "where artillery and missiles stop being the greatest threat."[70] This is where the argument over ATACMS starts. The Army wants to put the FSCL as deep as possible and also wants to be able to conduct operations beyond the FSCL. They disagree with the Air Force on the command and control procedures that should be used for operations conducted beyond the FSCL. We will now use joint publications to determine what control measures can be used to resolve the conflict over operations beyond the FSCL as well as FSCL placement.

Analysis of joint publications begins with the role of the JFACC. Joint Pub 1-02 states:

> The joint force air component commander derives authority from the joint force commander who has the authority to exercise operational control, assign missions, direct coordination among subordinate commanders, redirect and organize forces to ensure unity of effort in the accomplishment of the overall mission. The joint force commander will normally designate a joint force air component commander. The joint force air component commander's responsibilities will be assigned by the joint force commander (normally these would include, but not be limited to, planning, coordination, allocation, and tasking based on the joint force commander's apportionment decision). Using the joint force commander's guidance and authority, and in coordination with other Service component commanders and other assigned or supporting commanders, the joint

> force air component commander will recommend to the joint force commander apportionment of air sorties to various missions or geographic areas.[71]

The JFACC's responsibilities are not limited to apportionment of Air Force sorties. The JFACC must plan on the use of "joint air capabilities/forces."[72] The JFACC is also normally given the responsibilities of airspace control authority (ACA), and area air defense commander. The role of ACA requires the JFACC to "coordinate and integrate the activities of all users of airspace."[73] "JFC will normally assign JFACC responsibilities to the component commander having the preponderance of air assets and the capability to plan, task, and control joint air operations."[74] The Air Force will usually have the preponderance of air assets. Therefore, based on joint doctrine the Air Force is responsible for airspace control and deep operations as directed by the JFC. However, this does not give a relationship between deep operations and the FSCL.

Joint Pub 1-02 contains the following definition of the FSCL.

> A line established by the appropriate ground commander to ensure coordination of fire not under the commander's control but which may affect current tactical operations. The fire support coordination line is used to coordinate fires of air, ground, or sea weapons systems using any type of ammunition against surface targets. The fire support coordination line should follow well-defined terrain features. The establishment of the fire support coordination line must be coordinated with the appropriate tactical air commander and other supporting elements. Supporting elements may attack targets forward of the fire support coordination line without prior coordination with the ground force commander provided the attack will not produce adverse surface effects on or to the rear of

> the line. Attacks against surface targets behind this line must be coordinated with the appropriate ground force commander.[75]

The Army sees the FSCL as a permissive fire control measure and does not see the need to coordinate fires beyond it. The Air Force uses the definition in Joint Pub 3-0 which states, "Forces attacking targets beyond the FSCL must inform all affected commanders to allow necessary reaction to avoid fratricide."[76] The Air Force views coordination of attacks beyond the FSCL as essential and in accordance with Joint Regulations. As Joint Pub 3-0 further states:

> Joint Coordination of attacks beyond the FSCL is especially critical to commanders of air, land, and special operations forces. Their forces may now be operating beyond an FSCL or may plan to maneuver on that territory in the future. Such coordination is also important when attacking forces are employing wide-area munitions or munitions with delayed effects. Finally, this coordination assists in avoiding conflicting or redundant attack operations. In exceptional circumstances, the inability to conduct this coordination will not preclude the attack of targets beyond the FSCL. However, failure to do so may increase the risk of fratricide and could waste limited resources.[77]

The Air Force conducts continual operations beyond the FSCL and is very concerned with fratricide. The Army would like to see the Air Force subscribe to the "big sky, little bullet" theory.[78] This theory is that the risk of fratricide is minimal because the odds of being hit by a single artillery round or missile are low based on the large amount of airspace the Air Force operates in. From the Air Force perspective this is a flawed theory. The airspace of concern would be near targets. That is normally where the

Air Force would be operating. This is also an easy statement for the Army to make since they will be on the shooting end of the FSCL and the Air Force on the receiving end.

It is obvious that joint publications do not clear up the issue of deep operations. Both the Army and the Air Force believe the Army should be responsible for operations inside the FSCL. They do not agree on how operations should be conducted beyond it. It is this area, beyond the FSCL, where the use of ATACMS is unclear. To help establish a method for FSCL placement as well as fire control methods beyond it, we will look at how the FSCL was used in Operation Desert Storm.

Chapter II discussed the fact that in Operation Desert Storm CENTCOM, the theater headquarters, established the FSCL. It was used as a boundary to establish control of airspace. The ground commander was responsible for the area between the FLOT and the FSCL and the JFACC was responsible for the area beyond.[79] During the air campaign, the FSCL was placed close to the FLOT and the JFACC controlled operations beyond it. Army commanders were dissatisfied, with the initial FSCL placement, because they were not allowed to conduct deep strikes beyond the Saudi border without coordinating these operations with the JFACC. This was seen as an attempt to put all army deep operations under JFACC control. The primary concern of the JFACC was fratricide due to the large numbers of coalition aircraft

operating in the Kuwaiti Theater of Operations (KTO). This conflict caused the XVIII Airborne Corps to move the FSCL to the Euphrates River when the ground war started.[80] This makes sense from the army perspective. The XVIII Corps Commander wanted to ensure he had the freedom to conduct operations with his deep strike assets, such as ATACMS and attack aviation, without the delay that was caused by coordination with the JFACC. These coordination requirements routinely took longer than three hours.[81] This perception that the Air Force was not responsive to the Army's needs, with regard to ATACMS, resulted in FSCL placement that established a sanctuary and allowed Iraqi ground forces to escape destruction.[82] The placement of the FSCL at the Euphrates was based on the capabilities of Army deep strike assets alone. This illustrates the error of not considering all theater assets when planning deep operations. This also showed a weakness in the command and control capabilities of the JFACC. Expecting the land commanders to coordinate strikes beyond the FSCL when delays of three hours were occurring is unrealistic.

The FSCL issue stems from a fifference in how the Air Force and Army view the interdiction mission. The Air Force sees interdiction as one complete mission and does not separate it into close or deep. The Army views interdiction as having two separate categories; air interdiction (AI) and battlefield air interdiction (BAI). AI is an operation that is controlled by the CINC. BAI is an operation that is

controlled by corps commanders.[83] It is in the area of BAI that the Army feels it must retain the ability to shape the battlefield. "BAI provides one of the most powerful means for the corps commander to shape the deep battlefield."[84] Corps commanders have relied on air force assets to help them accomplish this mission. With ATACMS, commanders now have the capability to range beyond the FSCL and shape the battlefield with their organic weapon systems. How ATACMS is integrated into BAI without limiting the use of Air Force assets is the major question remaining from our Gulf War experience.

By appointing a JFACC the JFC plans: "to exploit the capabilities of joint air operations through a cohesive joint air operations plan and a responsive and integrated control system."[85] One of the primary responsibilities of the JFACC is to coordinate and execute the JFC's overall interdiction effort. While coordinating this effort, the JFACC must work with the joint forces land component commander (JFLCC) to establish target priorities.[86] The JFC also assigns the assets to the JFACC that he will use to conduct the interdiction campaign. It is up to the JFC as to whether or not the JFACC will be given the use of ATACMS. The JFC analyzes the systems that are available to conduct deep operations, and in accordance with his theater wide plan, decides what assets the JFACC will get, either OPCON or TACON, to conduct his operations.[87] This is all in accordance with joint doctrine and would appear to be

sufficient to control deep operations. There appear to be no limiting doctrinal concepts that prevent optimum employment of ATACMS as well as other deep strike assets. The responsibility for establishing control measures and where they should be placed rests with the JFC and this appears to be appropriate.

Doctrine is defined as: "Fundamental principles by which the military forces or elements thereof guide their actions in support of national objectives. It is authoritative but requires judgment in application."[88] It is important to note that doctrine requires the use of judgment. It is the judgment of the JFC that establishes how deep operations should be conducted and the allocation of assets. The JFC is also responsible for establishing the control measures that will be used.

VI. Conclusions and Recommendations

The research question was how will ATACMS affect the JFACC planned deep battle. Based on all the data contained in this paper, the following conclusions are made.

There is no doctrinal definition for the deep battle. However, this lack of definition of the deep battle does not create a vacuum where operations can not be conducted. Joint doctrine puts the responsibility for ensuring that there are seamless operations between deep, close and rear operations on the JFC. This is where the responsibility belongs. The JFC has all of the assets available to conduct deep operations and, using his intent, develops the concept

of operations as well as the control measures that are required.

The JFACC, acting as the agent for the JFC, should be able to use ATACMS as one of the weapons systems to conduct AI. The reductions in force size as well as the reduction in redundant capabilities that were addressed by the GAO report suggest this will be a necessity. The number of ATACMS that the JFACC will need will be based on the JFACC's ability to conduct AI with the fixed wing assets he has available and any shortcomings he perceives that may be filled by ATACMS. Considering the JFACC's recommendations, the JFC should then allot the number of ATACMS that would be necessary for the JFACC to conduct operations that will support the JFC's theater wide plan.

The JFACC will not be using all of the available ATACMS therefore the Army will also be shooting them. They will have requirements to service targets on both sides of the FSCL. The Air Force can not expect to limit the Army to conducting fires short of the FSCL. However, the requirement for coordinating these deep fires, with the affected agencies, will not go away. Corps commanders will conduct deep operations that will help shape the close battlefield. All of these operations will be conducted in compliance with the intent of the JFC.[89]

The FSCL cannot be established based on one weapon system. The solution to the overlap of Army deep fire assets and fixed wing assets is not to place the FSCL at the

maximum range of Army assets. As we have seen in Desert Storm, this procedure creates a sanctuary where targets that are not effected by ATACMS can hide. In future operations, this would limit the capabilities to service targets short of the FSCL and would have an overall negative effect on the JFC's ability to conduct operations throughout the entire depth of the theater. "To be effective, JFCs should not allow an enemy sanctuary or respite."[90]

The following recommendations are derived from the research. The Air Force must decrease the response time to allow the Army to service targets beyond the FSCL in a timely manner. By making the coordination process lengthy and complex, the Air Force delays the firing of ATACMS. This negates one of the greatest assets of ATACMS, its responsiveness. According to Air Force doctrine: "Responsibility for synchronizing theater interdiction assets should be vested in the commander who has the preponderance of attack assets and the C3I capability to conduct these operations; for interdiction it is normally the JFACC."[91] This responsibility includes the requirement to give the Army the flexibility of conducting deep operations in a timely manner. This responsibility would also seem to be implied in the JFACC's role as the ACA. The Air Force has the majority of the command and control assets, but deep operations are not only the concern of the JFACC. The Army has deep strike assets and doctrinal needs to conduct operations up to and beyond the FSCL. The JFC

must establish the control measures for the JFACC and the JFACC must establish procedures that allow the Army to optimize their deep strike assets. The Army must be allowed to shape the battlefield based on its perception of how to conduct the close fight.

The second recommendation is that the JFC must nominate a joint forces land component commander (JFLCC) the same way he nominates a JFACC. In operation Desert Storm, the JFC retained the duties of the JFLCC to avoid inter-service friction.[92] For this reason, there was no single land commander that had the same theater wide perspective and focus that the JFACC had. This is why the XVIII and VII Corps Commanders had to coordinate with the JFACC for FSCL placement. There was also no single agency that could ensure that the FSCL was moved in conjunction with the overall scheme of maneuver.

The reason for this may be the fact that joint publications do not give the same emphasis to the creation of a JFLCC as they do to the creation of a JFACC. Joint pub 1-02 defines the JFLCC as:

> The commander within a unified command, subordinate unified command, or joint task force responsible to the establishing commander for making recommendations on the proper employment of land forces, planning and coordinating land operations, or accomplishing such operational missions as may be assigned. The joint force land component commander is given the authority necessary to accomplish missions and tasks assigned by the establishing commander. The joint force land component commander will normally be the commander with the preponderance of land forces and the requisite command and control capabilities.[93]

However, that is the extent of JFLCC requirements that are addressed by joint publications. Joint publication 3-56.1 Command and Control for Joint Air Operations lists the procedures for nominating a JFACC and the targeting and staff requirements that are included with that function. There is no publication that gives the same specific requirements and procedures for a JFLCC. Establishing a JFLCC, that is equal to the JFACC, ensures placement of the FSCL will be based on theater wide requirements and coordinated with all of the land maneuver forces. The JFLCC should also advise the JFC on the appropriate amount of ATACMS that may be allocated to the JFACC and would establish target priorities that support the JFC's intent and the corps commanders' schemes of maneuver. The JFLCC, and his staff, could act as a coordinating authority to ensure all targets nominated by corps commanders fit with the JFC scheme of maneuver. While acting as the coordinating authority, the JFC staff could also assist in the coordination of the employment of ATACMS in a timely manner. The responsibility for ensuring responsive coordination would now rest with a ground commander who may have a better perspective of the corps commanders' intents than the JFACC.

The employment of ATACMS in future conflicts is an inevitability. This employment will present challenges to the JFC, JFACC and ground commanders. The solution is not

to use ATACMS along service lines. The solution is to improve current coordination capabilities and expand the current joint doctrine. This will enable the JFC to conduct seamless operations that support his concept of operations.

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